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# Marketing Practices in the Timber Bridge Industry: 1993

The Role of New Technology  
Adoption in the Timber Bridge  
Market: Special Project  
Fiscal Year 1992

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## PREFACE

**This publication is a technology transfer effort by the USDA Forest Service, Timber Bridge Information Resource Center, in cooperation with the Center for Forest Products Marketing, Department of Wood Science and Forest Products, at Virginia Polytechnic Institute and State University, under a grant from the USDA Forest Service.**

**This publication examines the current management and marketing practices of timber bridge manufacturers across the United States. Statistical differences on perceptions are compared, and some suggested methods for the manufacturer to expand into a potentially large market are made.**

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**Other publications in this five-part series are:**

- Factors Influencing the Adoption of Timber Bridges (Literature Review),  
NA-TP-02-95 (Part I)**
- A Perceptual Investigation into the Adoption of Timber Bridges,  
NA-TP-03-95 (Part II)**
- A Hierarchical Analysis of Bridge Decision Makers, NA-TP-04-95  
(Part III)**
- A Strategic Evaluation of Factors Affecting the Adoption of Timber  
Bridges, NA-TP-06-95 (Part V)**

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# Timber Bridge Information Resource Center

TECHNOLOGY  
TRANSFER

The Role of New Technology Adoption in the Timber  
Bridge Market: Special Project Fiscal Year 1992

245

## Marketing Practices in the Timber Bridge Industry: 1993 //

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Northeastern Area  
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Forestry





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## ABSTRACT

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Timber bridge manufacturers across the United States were surveyed to establish a base of information concerning current management and marketing practices. Forty-three percent of the firms studied were concentrated in the West, and less than one-third of the bridge companies were located in the South, Mid-Atlantic, and Northeast. Total sales of companies promoting timber bridges ranged from 1.2 million to over 2 billion dollars; however, average timber bridge sales accounted for only 7% of total sales. Wood treating and glue-laminating timber firms represented over 75% of reporting companies. Responding bridge firms rated state Department of Transportation employees as most important in the bridge decision and local highway officials as least important. Statistical differences existed between timber bridge firms and highway officials based on importance of factors in the bridge material decision. Bridge companies felt that timber bridge sales would increase by an average of 7.5% over the next five years.

## INTRODUCTION

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In recent years the U.S. Forest Service, along with many research institutions, have initiated programs to increase the use of timber (wood) in rural bridge replacement. Since 1989, more than 17 million dollars have been authorized by the United States Congress for research, construction, and promotion of timber bridges on U.S. rural highways (USDA 1993). It is believed that modern timber bridge designs will allow the use of under-utilized species and help stimulate local economies while rebuilding the rural infrastructure. New timber bridge designs present opportunities for firms to expand into the bridge market. Yet, little has been published concerning the marketing of timber bridges and bridge components. This study details current bridge marketing activities and helps identify opportunities that may exist in the bridge market.

Although once a major bridge material, timber has been replaced by concrete and steel as the material of choice for bridge replacement. Currently, the concrete and steel industries hold more than a 90% share of the bridge market. Timber bridges represent 8% of the 570,000 bridges listed on the National Bridge Inventory, and they represent less than 6% of replacement structures since 1982. Even with the current emphasis on wood as a bridge material, timber continues to decline in bridge use. Between 1982 and 1991 the number of timber bridges in the United States fell from approximately 70,000 to 46,000 structures (FHWA 1992). This indicates that timber bridges are being replaced by other materials, primarily concrete.

The Timber Bridge Initiative (USDA 1990) has brought to the forefront new technology that allows lower grades and under-utilized species to be designed into modern timber bridges. New timber bridge designs include: stress laminated longitudinal sawn members, glue-laminated members, "T" sections, "Box" beams, parallel chord trusses, and steel/wood composites (Moody et al. 1990).



Species utilized include red/white oak, red maple, cottonwood, red pine, eastern hemlock, southern pine, and Douglas fir. As Moody et al. (1990, p. 423) state:

*“As [a] result of the Timber Bridge Initiative, research on material properties, preservative treatments and system development has significantly expanded during the past years. Most of this research has addressed the development of new bridge systems with the emphasis on hardwoods, which are currently under-utilized for structural applications.”*

While extensive research has been done on new timber designs (e.g., Dickson and GangaRao 1989, Gutkowski and Williamson 1983, Moody et al. 1990, Ritter 1990), to date, little information is available concerning the manufacturing and marketing practices of firms promoting timber as a bridge material.

With an estimated 200,000 deficient bridges, and a replacement cost of 84 billion dollars (United States DOT 1991), a market opportunity exists for firms to expand into the production of timber bridges. Mater (1990) states there are numerous reasons to enter value-added markets:

- Secondary products earn higher profits
- Manufacturers can smooth the cyclic economic ups and downs of primary markets
- Quicker responses to new markets
- Broader customer base
- Opportunity to enter international markets

Marketing research is important to forest products manufacturers to understand potential markets for their products. According to Kallio (1980), the first step is to make a preliminary assessment to learn more about the industry, one's own firm, the current market situation, the channels of distribution, and promotional methods. This information serves as a basis for defining the problem and developing a workable approach to the solution. This study will provide the needed information for firms interested in entering or expanding into this potentially large market.

## **OBJECTIVE OF STUDY**

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The objective of this study was to determine the manufacturing and marketing practices of firms involved in the timber bridge industry. The marketing practices of these companies are compared to design engineers' perceptions of important bridge material factors to identify areas in which differences may exist. This information provides current manufacturers with important competitive information and provides those considering entering this market a basis to develop their marketing practices.



## METHODS

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A comprehensive list of 90 firms involved in the manufacture of timber bridge material was developed from the Timber Bridge Initiative participants (TBI 1993), the Timber Bridge Manual (Ritter 1990), Directory of the Forest Products Industry (Miller Freeman 1992-1993), and interviews with knowledgeable individuals within the industry. This list was reduced to 64 firms during initial telephone interviews to identify marketing personnel for each company. In some cases, the listed company was no longer in business or they did not participate in the manufacturing or marketing of timber for bridge construction.

A mail questionnaire directed toward the marketing manager or plant manager was used for primary data collection. A mail survey is considered an efficient and cost-effective way of securing data from a wide geographic base. The questionnaire consisted of three primary areas. The first area used rating scales to measure the importance of different marketing methods, factors in the bridge decision process, and the perceived importance of different groups of highway officials in the choice of a bridge material.

The second area was exploratory, requesting information on the company's major type of business, product lines, marketing activities, and locations. The final area consisted of open-ended questions regarding future expectations of timber bridge sales and major concerns within the industry. The questionnaire was reviewed by knowledgeable university and industrial personnel to test its face validity, clarity, and to assure no important information was overlooked. The questionnaire was pretested with four timber bridge firms prior to its use. The responses from the pretest were used to clarify question wording and order.

The questionnaire, along with a hand-signed cover letter explaining the purpose of the study, was mailed to 64 firms in September 1993. Fifty-five questionnaires were returned, 31 of which stated their firms were involved in the manufacture or promotion of timber as a bridge material. Twenty-four companies said they were not involved with timber bridges. This resulted in a useable response rate of 77%. After two repeat mailings of the questionnaire and cover letter, the non-responding companies were contacted by telephone to urge participation. These nine companies stated it was either against company policy to answer questionnaires, the company was not active in the timber bridge market, or they would respond soon.

Although the list of manufacturers was intended to be comprehensive, the possibility of missing companies does exist. In order to check non-response bias, early respondents were compared with late respondents on selected questions. Since sample size was small, non-parametric statistical tests (Mann-Whitney U and Kruskal-Wallis ANOVA) were utilized. Only on the importance rating of advertising, did statistical significance exist at a .05 level. These results indicate that respondents are representative of the population, and non-response is not a problem.



## RESULTS

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### Respondent Characteristics

Nearly one-half of the 31 timber bridge firms listed wood treating as their primary business. Thirty percent were categorized as glue-laminated timber manufacturers, and 10% indicated they were lumber brokers or representatives. Only one of the responding firms listed itself as primarily a timber bridge manufacturer, and one company provided timber bridge design and sales (Table 1). This information indicates that timber bridges currently represent extensions of product lines, rather than constituting a primary business. Three-quarters of the companies said they manufactured timber bridges, and ten percent said they represented firms that manufacture timber.

With extensive research being conducted on utilizing lower grades of lumber and under-utilized species for timber bridges, manufacturers were asked to indicate what species they currently use. Overwhelmingly, southern pine and Douglas fir were the species of choice. Nearly 70% of respondents used southern pine, and more than 50% said they used Douglas fir (Fig. 1). Red/White oak, red maple, and red pine were other species used. One company said it used imported tropical species, and one firm used Alaskan cedar. As new bridge designs prove themselves in the market and are included in the American Association of State Highway Transportation Officials (AASHTO) specifications, increased use of hardwoods and softwoods other than southern pine can be expected.

Dickson and GangaRao (1990) state that since the demand for structurally reliable, long, wide sawn components cannot be met, reconstituted timber products have risen to meet the demand. Timber materials can be combined to use the material properties to maximum advantage. The utilization of lower grade and under-utilized species into reconstituted or composite wood products will allow their expanded use into timber bridges. This has been demonstrated with the use of red pine, red/white oak, red maple, and yellow poplar in glue-laminated timber for bridge construction.

The primary products of firms manufacturing timber bridges are utility poles, guardrails, foot bridges, fence posts, landscape timbers, and treated lumber. Nearly one-third of the firms said they produce softwood lumber, structural glue-lams, railroad ties, or pilings. Other products included wood box culverts, salt storage buildings, cross arms, sound barriers, wood trusses, mine and crossing timbers, and fence materials. This information indicates that timber bridges can complement a variety of product lines as a manufacturer looks to expand; however, many of these products require framing, engineering, or prefabrication capabilities.

Although the Timber Bridge Initiative has generated new interest in timber bridges, the average time in business of responding firms was 36 years. This ranged from a reported minimum of 2 to a maximum of 101 years in the timber bridge industry. Total sales of companies ranged from 1.2 million to 2.3 billion dollars annually.

On average, sales from timber bridge materials represented only 7% of total sales, but ranged from less than 1 to 100 percent. This was highly skewed on the lower end. More than 75% of companies said bridge sales were less than 10% of total sales.

Over one-half (54%) of the responding companies said they have participated in the Timber Bridge Initiative. Nearly 40% of respondents provide a complete timber bridge package, but only 7 of these 12 firms said they can supply engineered plans with the bridge package. The other companies are relying on outside consultants or county or state highway officials to do the design of the structure.

## **Marketing Activities**

Marketing has been called the backbone of most profitable wood products companies (Cesa 1992). Yet, for many firms, it is a difficult concept to understand. It becomes even more complicated when purchase decisions are made by the government or by a group of individuals, as with most industrial products. Rich (1970) states that forest product companies are turning toward a marketing orientation because of:

- the growing intensity of new product competition, including non-wood materials
- the emergence of many different customer groups with new and distinctive product needs
- the changing distribution patterns required to serve those needs.

The loss of market share by the timber industry in bridge construction during the twentieth century may be attributed, in part, to a lack of marketing research and a thorough understanding of one of the bridge customers (the design engineer). Marketing research is necessary for forest products firms to plan for marketing new products or to plan for development of new products (Kallio 1980). The following sections give an overview of the marketing practices of timber bridge suppliers. It also reveals how their perceptions on selected marketing activities compare to the perceptions of the bridge customer.

The Midwest had the largest number of firms reporting they market timber bridges in that region (20 or 65% of responding companies). The West had the largest number of producers of timber bridges (12). Only 14 of the 31 bridge firms said they actively marketed in the West. This could be because of the high number of firms, or the inability to compete effectively with Douglas fir as a bridge material in that region. Over 55% of the firms said they marketed bridges in the South, Mid-Atlantic, and Northeast (Table 2). Five (17%) of the responding firms reported they marketed their product outside the United States. This indicates that an international market exists for timber bridges, and that those firms not involved could expand by exploring this area.

The primary method of serving the bridge customer was with an inside sales staff (68%). One-third of the companies stated they employed outside sales people. Manufacturers' representatives, brokers, and bridge contractors were the other methods of servicing the bridge market. Ten percent of the firms stated they had no one specifically involved in marketing (Fig. 2).



The promotional mix of bridge firms was lead by personal calls by sales people. Sinclair (1992) states that personal selling is clearly more expensive on a per contact basis than advertising; however, it dominates the promotional mix of many major wood products corporations. Many firms believe that personal selling is necessary when the unit of sale is large, the product is complex, and the product benefits have to be carefully matched to the customers' desires (Hiam and Schewe 1992). These factors are all important in the promotion of timber bridges.

It must be recognized that the selection and design of bridges is a long-term process. It is not uncommon for this process to take as long as three years. This results in the salesperson being involved in *missionary* sales, just to inform the customer that timber is an alternative for their bridge needs. The bridge is normally purchased by a contractor through a formal governmental bid procedure, with low bid usually being accepted. Other elements in the promotional mix of timber bridges include sales literature, displays at trade shows, providing engineering assistance, advertising, and seminars to customers (Fig. 3). Over 10% of the respondents replied they participated in no promotional activities.

### **Perceptions of the Purchase Process**

Understanding the customer is one of the primary purposes of marketing research. To identify important factors in the bridge decision process, an extensive investigation of bridge engineers and highway officials was undertaken by Smith and Bush (1994). This section will discuss how current timber bridge marketers compare with selected factors from this earlier study. This information will provide insight into needed areas of improvement in the marketing programs of such firms.

Firms were asked to rate the importance of the different decision makers in the bridge decision. State Department of Transportation (DOT) officials and private consulting engineers were rated statistically higher than county and local officials (Fig 4). Depending upon the state in which the marketing activities are being directed, this would allow promoters of timber to direct their activities more efficiently. The importance of the three decision-making groups (state DOT, private consultants, and local officials) varies greatly by region and state. Timber bridges have had greatest success where local control of rural roads is strongest (Luppold 1991). Yet, in many states standard bridge plans are routine, and state DOTs discourage non-standard designs when appropriating federal highway funds. Many states do not have standards for complete timber bridge design, making it difficult for these projects to receive federal highway funds.

Bridge firms were contrasted with decision makers on the importance of eight sources of bridge information (Table 3). Although statistical difference existed in all but one area, government research, the order of the information source was similar, with one exception. Current bridge firms listed personal calls by sales people second in importance, while highway officials ranked personal calls fifth in importance.

The top four criteria for decision makers included other highway officials (peers), government research, journal articles, and seminars on bridge materials. All of these factors can be classified as *educational activities*. The lowest factors included advertisements in magazines, trade shows, unsolicited sales literature, and personal calls by sales representatives. Standard marketing practices provided the least information during the selection of bridge materials (Table 3). This information should assist timber bridge marketers with the direction of their promotional efforts, toward the *educational activities* of the decision maker.

Twenty-three important non-structural factors in the bridge decision were rated by design engineers across the United States (Table 4). It is believed these are the areas in which promoters of timber bridges can best direct their efforts in meeting highway officials needs. The most important factors rated on a scale from 1 to 7 by decision makers included:

- Lifespan of material
- Past performance
- Maintenance of material
- Natural deterioration
- Initial cost
- Life-cycle cost of material

In contrast, the manufacturers and marketers of timber bridge materials rated these factors as follows:

- Designer's familiarity with material
- Initial cost
- Lifespan of material
- Local official's preference
- Maintenance requirements
- AASHTO specifications (Table 4)

Surprisingly, the bottom two factors listed in Table 4, *government research and industry promotional efforts*, were rated similarly by both groups.

These results indicate that marketers of timber bridges feel that an individual's preference and specifications play a much larger part in the decision than it actually does. Decision makers are much more interested in the long-term *performance* and *maintenance requirements* of the material. Promoters of timber place a higher emphasis on *initial cost* than does the decision maker. Since cost is an important factor, manufacturers may feel this is one area where they can effectively compete with other bridge materials. *Initial cost* may be a more controllable factor to the manufacturer than *past performance* and *maintenance requirements* of the material.

## DISCUSSION

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Although the current timber bridge industry represents a small portion of wood utilized by the forest product's field, this study discusses the variety of businesses that could complement their product line by expanding into this potential large market. The primary manufacturing necessary is fabrication and treating capabilities. Current marketing procedures rely heavily upon inside and outside sales representatives. Promotion consists of outside sales people, literature, and attendance at trade shows. Promotion often consists of *missionary* sales, in which the salesperson informs and educates the bridge specifier of the benefits of timber. Once the bridge is designed, however, it will normally go to a formal bid procedure, where the low bidder usually is awarded the contract.

This study revealed that differences exist between timber bridge firms and bridge material decision makers. The industry placed more importance on sales people and less on government research findings. Industry must meet the *educational needs* of the bridge specifier and rely less on standard marketing activities. Differences existed between the two groups on important factors in the bridge decision process. Industry felt that *initial cost* and *familiarity* with materials played a larger role in the decision than did the specifiers of bridge material. Specifiers placed much more emphasis on the *performance* and *maintenance* of materials. These are the areas that manufacturers/promoters must work to improve for timber bridges to be more accepted.

Current timber manufacturers must place an emphasis on the development of new bridge technology and improve on past timber designs. Bridge manufacturers should concentrate their efforts on the wood/non-wood combinations of new technologies in their marketing efforts. William Bulleit (1993, p. 45) states:

*"The attitude that wood should compete with concrete and steel by remaining "pure" and not integrating with other materials needs to be changed. Concrete would not be the structural material it is today if it had not been integrated with steel."*

Efforts must be directed at increasing the *lifespan* and reducing or eliminating *maintenance* requirements for new timber bridges. This will require further research on improved wood preservatives and methods to increase the lifespan to more than fifty years as is currently being attained by concrete. Bridge designs are needed that will drastically reduce the amount of maintenance required for timber bridges. The *bottom line* is that rural bridge maintenance is normally done by local units of government, which in many cases do not have the appropriate funding necessary to do an adequate job of routine maintenance procedures.

Although much of the current emphasis has been sponsored by the public sector (USDA Forest Service and research institutions), long-term acceptance of new timber bridges will depend on private enterprise to meet customer needs.



Rosenberg et al. (1990) state that commercial success ordinarily goes beyond what can reasonably be attained by a public agency: fine-tuning the product design and characteristics to the specific needs of specialized categories of users, as well as improving process and machinery for which the public sector has only a modest capability. Efforts to bring about better treatments and designs are currently underway by the U.S. Forest Service as part of their Timber Bridge Initiative. Yet, for timber bridges to improve their position in the marketplace, manufacturers have a responsibility to meet the needs of the bridge customer.

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**Table 1.** Respondents' Primary Type of Business and Relationship to Timber Bridges

<i>Primary Business</i>	<i>Number Firms (Percentage)</i>	
Wood Treating	14	(47%)
Glue-Lam Manufacturer	9	(30%)
Broker or Manufacturer's Rep.	3	(10%)
Softwood Lumber	2	(7%)
Timber Bridge Manufacturer	1	(3%)
Timber Bridge Design and Sales	1	(3%)
<i>Timber Bridge Business</i>		
Manufacturer	23	(74%)
Manufacturer's Representative	3	(10%)
Sale of Treated Lumber	2	(7%)
Bridge Rehabilitation Contractor	1	(3%)
Importer	1	(3%)
Timber Bridge Design and Sales	1	(3%)

**Table 2.** Location of Production and Marketing Activities of Respondents

<i>Location</i>	<i>Production Facilities</i>		<i>Marketing Activities</i>	
West	12	(43%)	14	(45%)
South	4	(14%)	17	(55%)
Mid-Atlantic	5	(18%)	19	(61%)
Northeast	1	(4%)	17	(55%)
Midwest	6	(21%)	20	(65%)
Outside U.S.			5	(17%)

**Table 3.** Importance of Bridge Information Sources

<i>Bridge Information Sources</i>	<i>Highway Officials Mean Rating*</i>	<i>Marketers Mean Rating</i>	<i>P-Value</i>
Other Highway	5.41 (1)	5.87 (1)	.04
Government Research	4.72 (2)	4.71 (5)	.96
Journal Articles	4.29 (3)	5.20 (3)	.00
Seminars	3.47 (4)	4.83 (4)	.00
Personal Calls by Sales Reps.	2.48 (5)	5.61 (2)	.00
Unsolicited Sales Literature	2.45 (6)	3.21 (8)	.00
Trade Shows	2.44 (7)	4.42 (6)	.00
Ads in Magazines	2.17 (8)	3.48 (7)	.00
* Rating scale range 1 (below average) to 7 (above average), 4 = average			

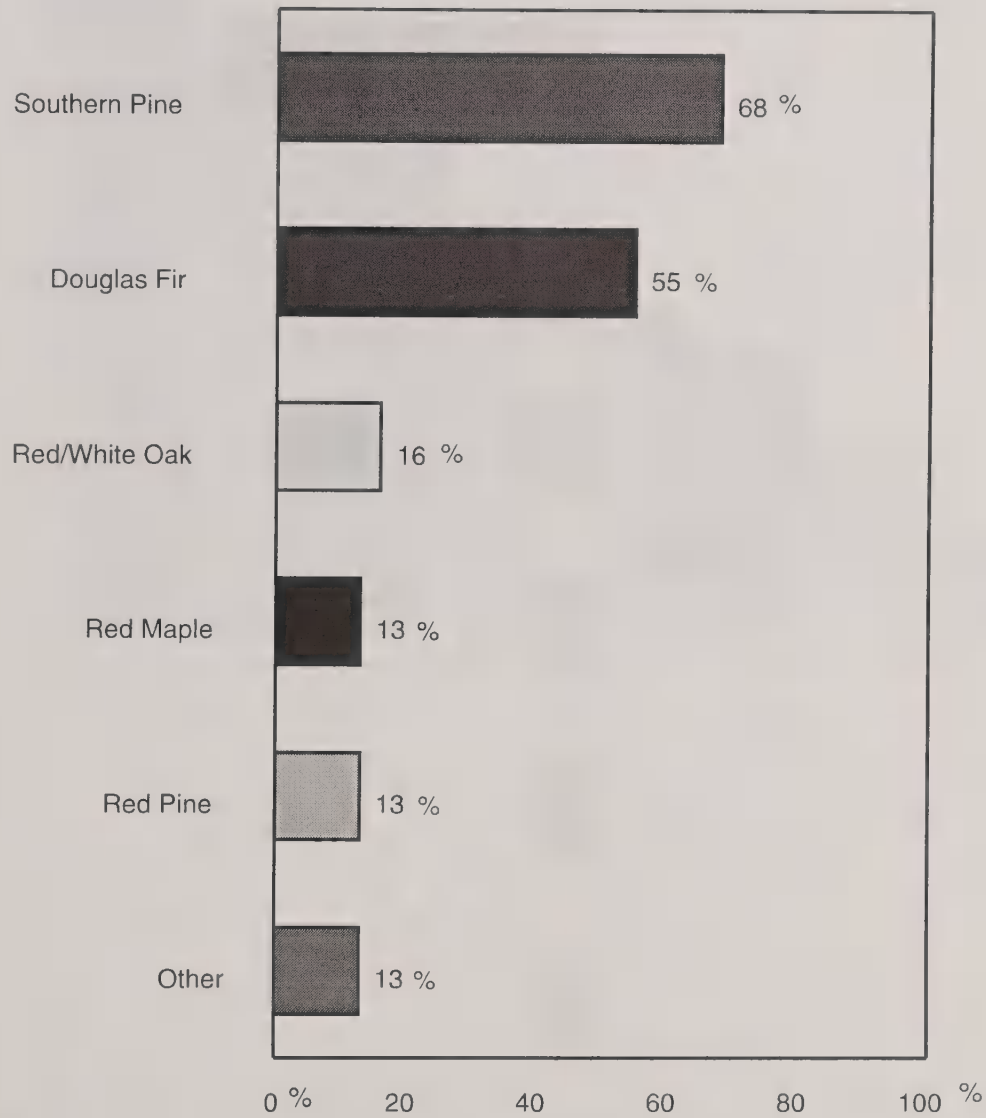


**Table 4.** Importance of Non-Structural Factors in Decision Process

DECISION GROUP					
Bridge Material Factor	Highway Officials (Mean rating)		Timber Bridge Marketers (Mean rating)		P-Value MANOVA
Lifespan	5.95*	(1)	5.65	(3)	.21
Past Performance	5.92	(2)	5.48	(7)	.10
Maintenance	5.84	(3)	5.52	(5)	.14
Natural Deterioration	5.82	(4)	5.26	(12)	.01
Initial Cost	5.54	(5)	6.10	(2)	.01
Life-cycle Cost	5.51	(6)	5.45	(8)	.82
Ease of repair	5.25	(7)	4.90	(13)	.24
Specifications in AASHTO	5.24	(8)	5.52	(6)	.11
Time of Traffic Interruption	5.08	(9)	4.87	(14)	.33
Designer's Familiarity	4.86	(10)	6.19	(1)	.00
Design Information	4.85	(11)	5.37	(10)	.04
Resistance to De-icing Chemicals	4.84	(12)	4.87	(14)	.99
Environmental Concerns	4.66	(13)	5.29	(11)	.01
Inspection Requirements	4.65	(14)	4.42	(21)	.44
Loading Variations	4.56	(15)	4.84	(17)	.37
Contractors Familiarity	4.41	(16)	5.42	(9)	.00
Average Daily Traffic (ADT)	4.41	(16)	4.55	(20)	.66
Aesthetics	4.34	(18)	4.87	(14)	.03
Local Officials' Preference	4.23	(19)	5.65	(4)	.00
Local Economy	4.11	(20)	4.58	(19)	.06
Bridge Ownership	3.98	(21)	4.77	(18)	.02
Government Research	3.82	(22)	4.13	(23)	.07
Promotional Efforts	2.81	(23)	4.32	(22)	.00

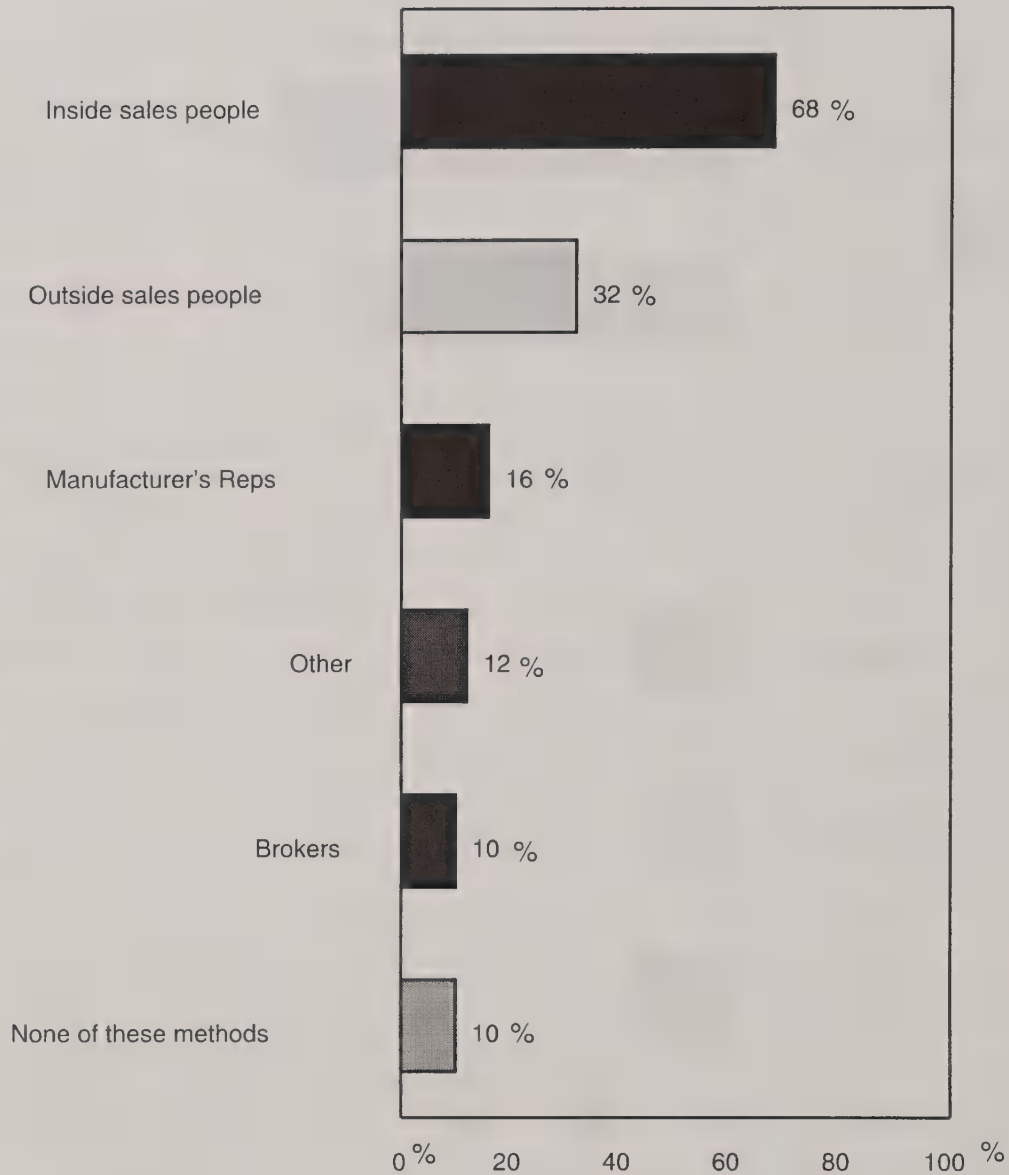
\* Rating scale: 1 (below average) to 7 (above average), average = 4  
( ) ranking of factors

### Percentage of Bridge Firms Using Various Species



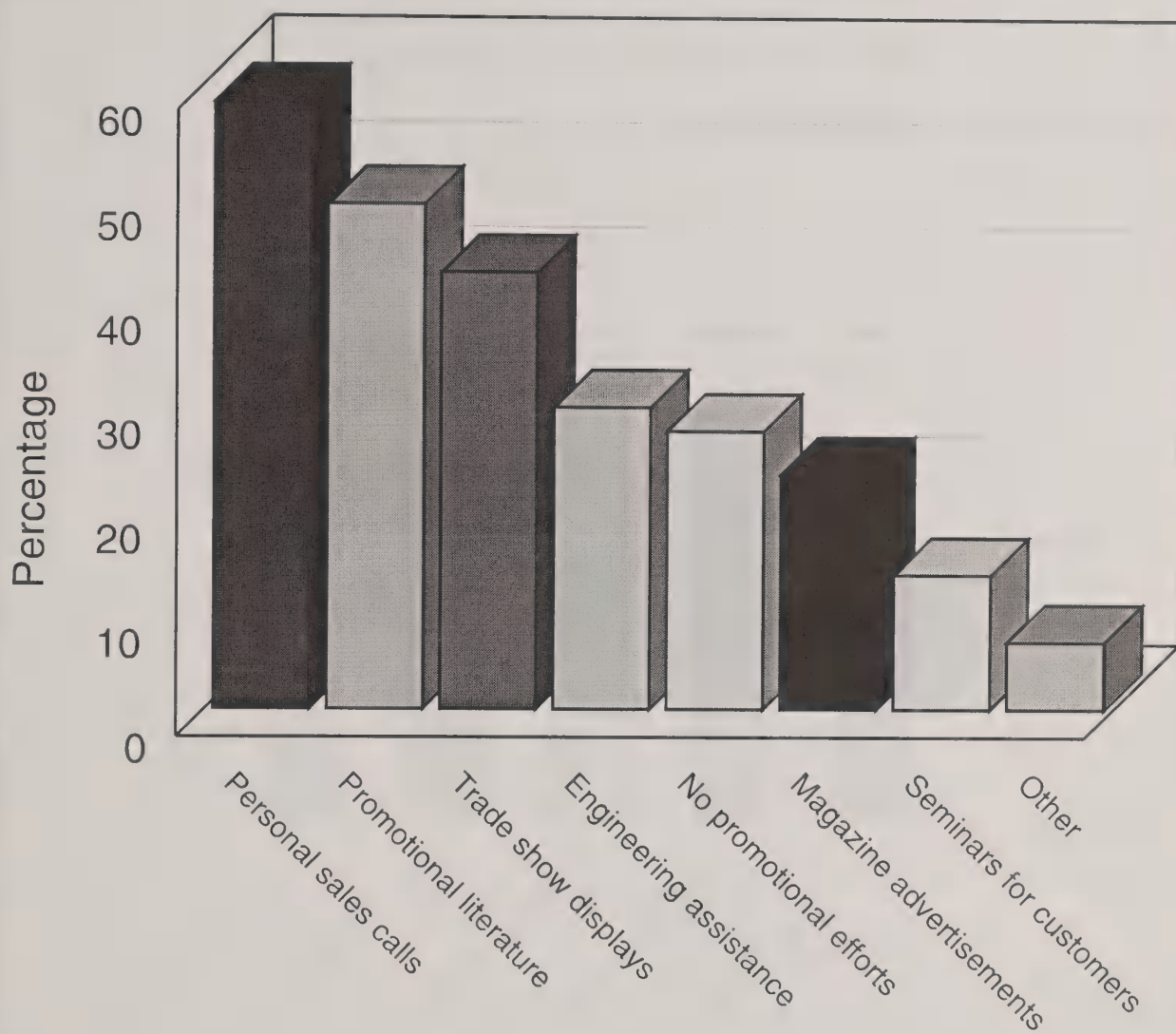
**Figure 1.** Percentage of bridge firms using various species

### Methods of Promotion and Distribution of Timber Bridge Firms



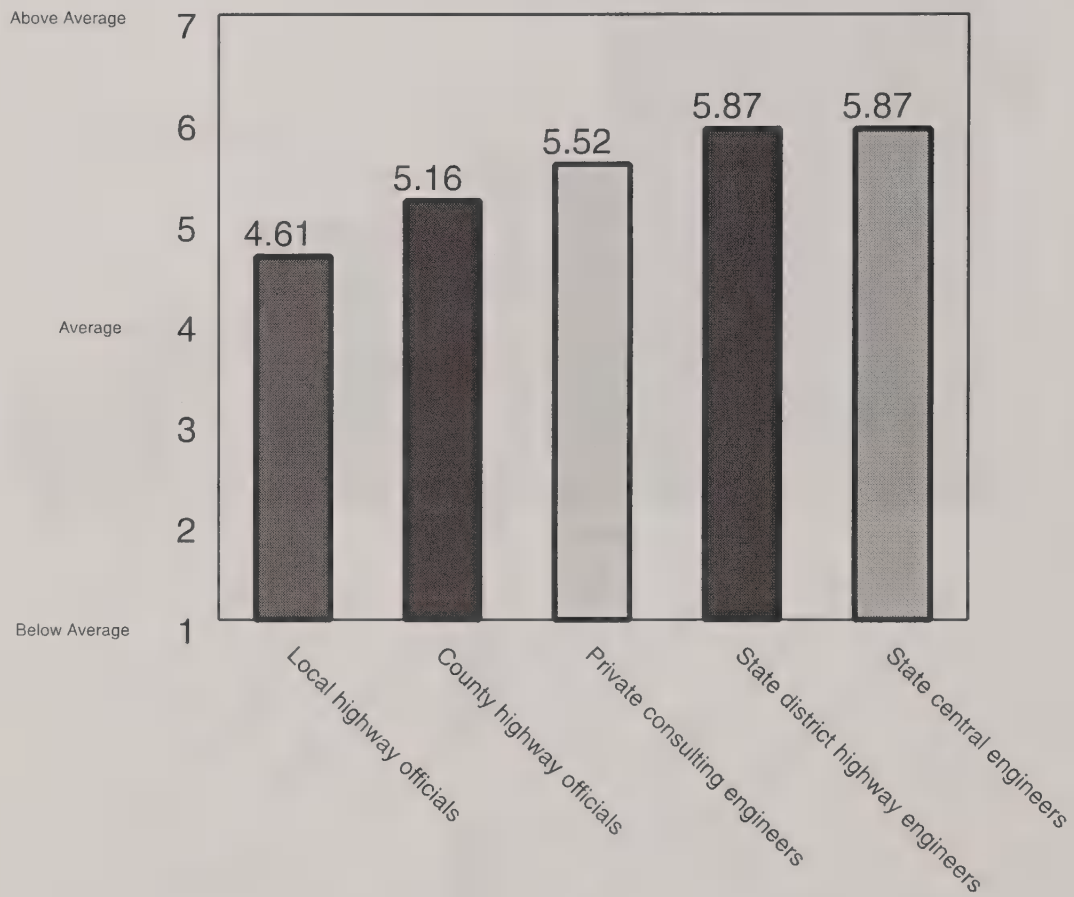
**Figure 2.** Methods of promotion and distribution of timber bridge firms





**Figure 3.** Percentage of firms using selected promotional activities

# Importance Rating of Bridge Decision Makers by Timber Bridge Firms



**Figure 4.** Importance rating of bridge decision makers by timber bridge firms

**For more information contact:**

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